Olympia Oyster Stock Rebuilding Plan for Washington State

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Background and Introduction

The Olympia oyster (*Ostrea lurida*) is native to the Pacific coast of North America and occurs in marine waters from Bahia de San Quentin, Baja California, to Sitka, Alaska (Ricketts and Calvin, 1968). It primarily inhabits sheltered waters or estuaries. Once common in Washington State, the Olympia oyster now has a restricted and very patchy distribution in Willapa Bay, Grays Harbor, and southern Puget Sound.

The Olympia oyster has been the focus of human harvest for several thousand years. The oyster has an important identity for the Washington tribes who used the oyster, named Tusa'yad by the Skokomish, extensively, and often based settlement locations on its harvest (Washington Secretary of State, 1935; Elmendorf, 1992; Steele, 1957). With European colonization, the Olympia oyster supported a large commercial industry. Olympia oyster beds from Puget Sound, Hood Canal, and Willapa were harvested extensively, and later cultivated with an elaborate system of dikes (Steele, 1957; Westley et al., 1985; Brown, 1976). Overharvesting in the late 1800s and severe water quality problems in the 1930s to 1950s caused Olympia oyster stocks to crash, and the industry to terminate.

Recent interest and concerns about the status of native Olympia oyster stocks in Washington State waters, widely recognized to be reduced from historical levels, led the Washington Department of Fish and Wildlife (WDFW) to begin developing a stock-rebuilding plan. General goals of Olympia oyster stock rebuilding include wise stewardship, maintenance of genetic integrity, and ecosystem restoration. The goal of the Olympia Oyster Stock Rebuilding Plan is to restore and maintain Olympia oyster populations on public tidelands in their former range.

Status of the Population

Current and historical distribution of Olympia oyster in Washington coastal and inland waters is summarized in Figure 1.

Historical Population Size and Distribution

Olympia oyster stocks were historically very large in Washington State with reported annual landings of over 130,000 bushels around 1890, principally from Willapa Bay. Within the inland waters of Washington, the Olympia oyster had a scattered distribution throughout Puget Sound and Hood Canal (Westley, 1976). Samish Bay once supported a large, naturally occurring Olympia oyster population, which was severely depleted in the 1800s by overharvest (Brown, 1976). The most abundant natural Puget Sound populations historically occurred around Olympia, primarily in Mud and Oyster Bays (Steele, 1957).

Current Population Size and Distribution

The oyster is present on oyster reserves in North Bay, Case Inlet, and southern Puget Sound, where dense natural sets have been observed in the years 1995–1997. Shellfish growers in south Puget Sound noticed similar sets in the mid-1980s, but these were subsequently wiped out by severe winter weather. Comparison of historical documents and local knowledge indicates that current numbers are at best a mere fraction of, and possibly more ephemeral than, historic populations.

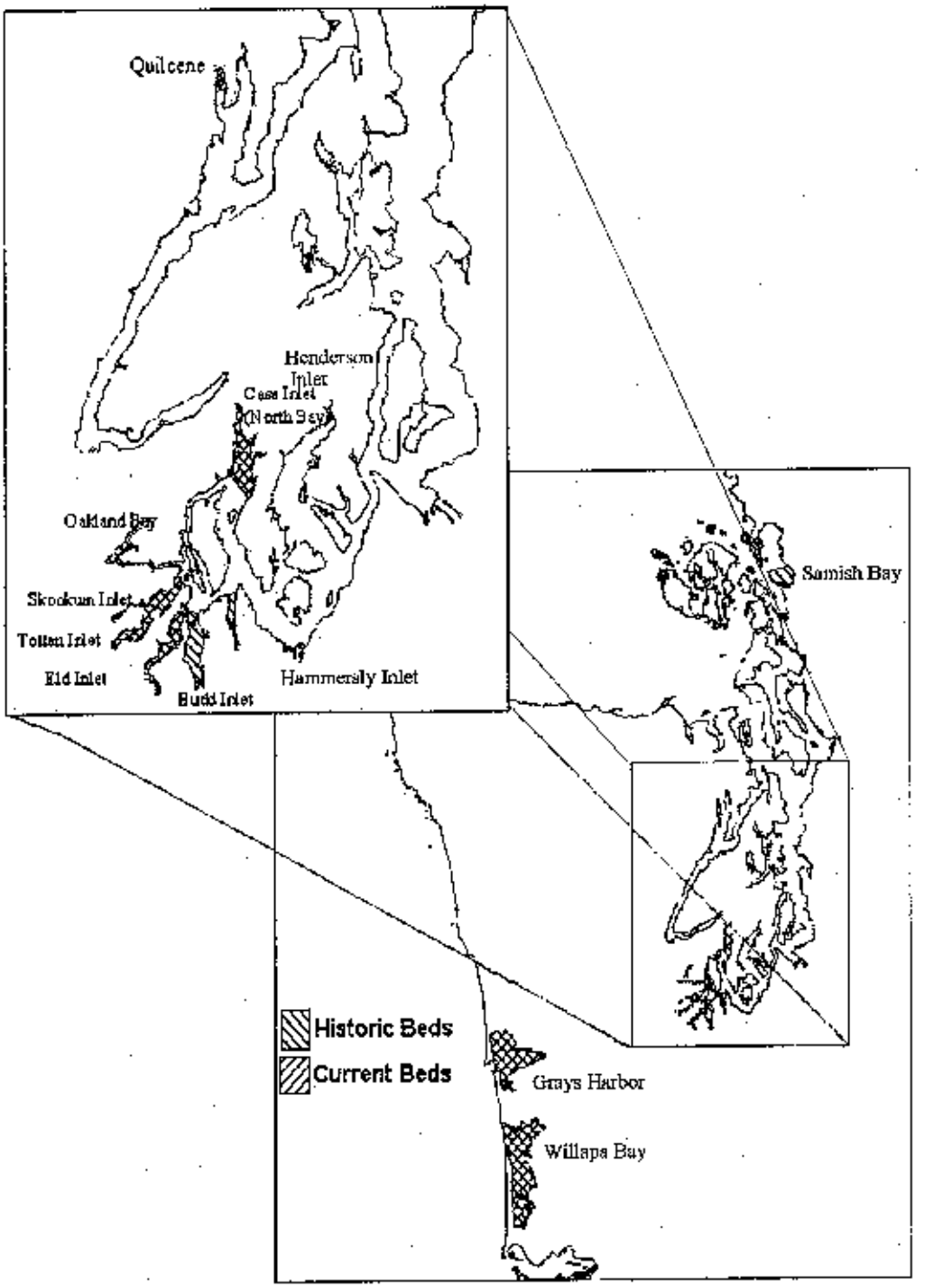

Figure 1. Current and historic distribution of the Olympia oyster in Washington State.

Management

Olympia oysters will be co-managed with the tribes and other government agencies, according to the provisions in the federal district court's orders and judgments filed in United States v. Washington No. 9213, subproceeding 89-3. The following is a synopsis of current management.

Non-Tribal Fishery Management

Non-Tribal Commercial Fishery: WDFW harvest reports from 1897–1990 (Figure 2) show a general decline in commercial production of Olympia oyster from a high of >200,000 gallons in the early part of the century to an annual production of <1,000 gallons since 1979. Preliminary data for the years 1991–1996 show an annual commercial harvest of approximately 500 gallons (about 4,000 pounds of shucked oysters), mostly occurring in south Puget Sound on private tidelands.

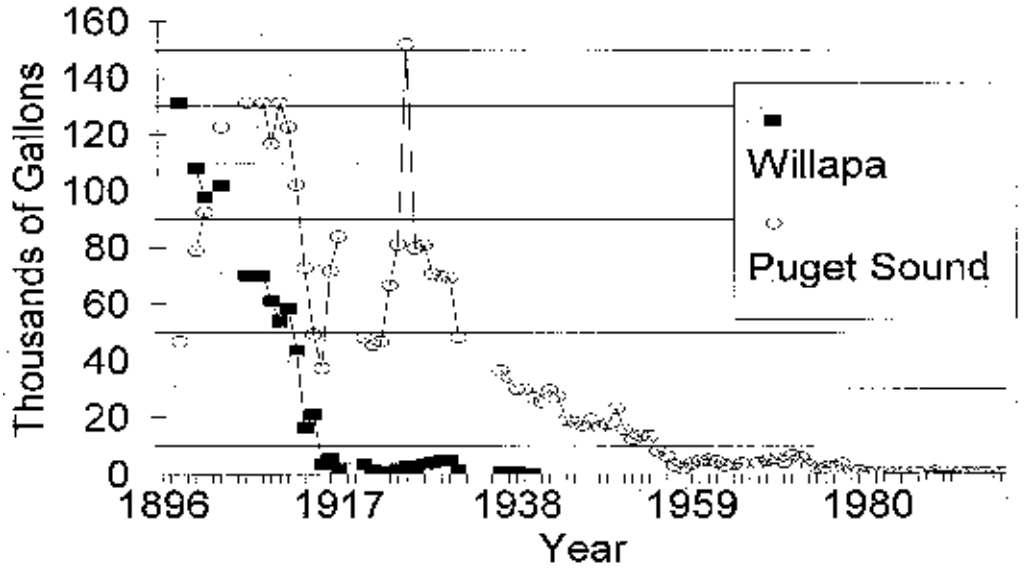

Figure 2. Olympia oyster production in Washington State.

There are currently three commercial Olympia oyster growers that operate solely on private tidelands on Puget Sound. Management of stocks on private tidelands is controlled by private growers. Washington State Department of Health requirements must be met, and quarterly harvest reports are required by WDFW.

Oyster reserves were established in 1890 for the preservation and growth of Olympia oysters (Woelke, 1969). The reserves originally consisted of 11,239 acres in Willapa Bay and 4,500 acres in Puget Sound. Some lands have since been sold by the legislature. Reserves currently encompass 10,000 acres in Willapa Bay and 1,000 acres in southern Puget Sound.

With the decline in the Olympia oyster population, reserve laws were changed in 1947 to reflect the growing importance of the Pacific oyster, *Crassostrea gigas*, on reserve tidelands, particularly in Willapa Bay. Willapa Bay reserves are now actively managed for commercial harvest of the Pacific oyster. An average of 54,000 bushels of Pacific oysters are sold each year from managed intertidal tracts and $79,000 returned annually to the state general fund (Dumbauld and Kauffman, 1996). Growers are required to return 40% of the live oyster volume in shell to the tracts to maintain stocks via natural spawning and settlement.

No commercial oyster harvest occurs on the public lands of Puget Sound oyster reserves. While Olympia oysters exist on both the Willapa Bay and Puget Sound reserves, no active management has

occurred for this species and the last commercial harvest of Olympia oysters on reserve tidelands in Puget Sound took place in 1929.

Non-Tribal Recreational Fishery: The Olympia oyster has been managed passively on public beaches for many years. Olympia oysters are included in the regulations that apply to all classified oysters. Current harvest limits include: 1) combined daily limit of 18, and 2) oysters must be shucked on the beach and the shells left at the same place/tide height where they were taken. They may be harvested only by hand or with a hand-held manually operated prying tool (no hammers, etc.).

Beginning 1 May 1998, new regulations will be in place for all areas except Hood Canal (e.g., south of Foulweather Bluff) and the outer coast. These regulations will include size restrictions designed to minimize recreational harvesting of Olympia oyster.

All oyster reserves are currently closed to intertidal recreational clam and oyster harvest, with the following exceptions: 1) one Oakland Bay beach is open to clam harvest only; 2) a North Bay reserve beach, which is open to both clam and oyster harvest beginning in 1998; and 3) two areas on the Long Island Oyster Reserve have been opened for clam and oyster harvest. Seasons for non-reserve beaches are set based on the population and projected harvest of Pacific oysters. With the exception of one beach in North Bay, Puget Sound oyster reserves are not currently actively managed for oysters. Oyster dikes in Oakland Bay have created excellent habitat for Manila clams. Although the majority of these reserves are closed to recreational clam and oyster harvest due to access issues, these Manila beds provide stock to trade with the tribes to enhance other recreational opportunities.

Tribal Fishery Management

Tribal Commercial Fisheries: Tribes of inland and coastal Washington have played a dominant role in historic commercial harvest of Olympia oysters (Steele, 1957) and at least one tribal war was fought over rights to harvest Olympia oysters (Swan, 1857; Esveldt, 1948; Steele, 1957). There are no known current targeted tribal commercial fisheries for Olympia oysters. However, commercial harvest of Olympia oysters is not prohibited in the State/Tribe Interim Management Agreement except in areas the state has declared as artificial beds. The Point No Point Treaty Council Tribes are the only tribes that have issued regulations for commercial oyster harvest (species not specified) on public tidelands, and their annual commercial regulations have a clause prohibiting the harvest of oysters less than two inches in length during openings for single oysters, which would eliminate virtually all harvest of Olympia oysters. The majority of tribal oyster openings are for single oyster harvest. Some harvest of Olympia oysters could potentially occur when clusters are harvested, which has occurred recently at only a few beaches.

Tribal Ceremonial and Subsistence Fisheries: Olympia oysters may be harvested in ceremonial and subsistence fisheries.

Status of Genetic Integrity of Olympia Oyster Stocks

Conserving the natural genetic integrity of Olympia oyster stocks is an important component of any stock recovery strategy. Artificial enhancement of Olympia oyster stocks should meet acceptable standards for maintaining genetic stock integrity for indigenous species. Some standards to be met are: 1) brood stock for seed production should come from the same geographic area where seeding will take place; and 2) the minimum number of brood stock necessary to maintain genetic variability while maintaining stock identity should be established and maintained.

Research suggests that the rate of natural genetic exchange between coastal populations in Washington, Oregon, and northern California is low (Baker, 1995); however, no information exists on genetic exchange within Washington waters. This is particularly important when considering historic Olympia oyster farming practices, which included seed transport both within and between regions. Genetic integrity will be a topic for further dialog in Olympia oyster rebuilding efforts.

Factors Affecting the Population

Habitat and Water Quality

Pollution has been shown to be the number one factor in the demise of the Olympia oyster throughout lower Puget Sound and Hood Canal. Sulfite waste liquor (SWL) from the Rayonier pulp mill built on Oakland Bay in 1927 was identified as the reason for the demise of all south Puget Sound Olympia oyster stocks. Tidal currents carried effluent to Oakland Bay beds within a tidal cycle, and throughout lower Puget Sound within a matter of days. Dramatic population crashes, witnessed throughout the Olympia oyster beds, destroyed the industry by the mid-1940s. The Rayonier mill was closed in 1957. Unfortunately, the industry had crashed by that time, so monitoring of the Puget Sound and southern Hood Canal populations had ceased (Steele, 1957; Gunter and McKee, 1960).

Water quality impacts in Washington's waters have shifted over the last 40 years from industrial effluent to non-point source pollution. Impacts of contemporary water quality degradation to residual Olympia oyster stocks is not known. Contemporary water quality impacts to Olympia oysters of the coast and inland waters include: low dissolved oxygen (DO), chlorine from sewage outfalls, non-point pollution and associated eutrophication, sedimentation and siltation, and herbicides (Couch and Hassler, 1989; Dumbauld, 1997; McMillen, 1978).

Harvest

Overharvesting has been identified as the leading cause of Olympia oyster stock crashes in Samish Bay (Puget Sound) and Willapa Bay in the 1800s. Harvesting of other commercially valued species may also impact the Olympia oyster where they co-occur.

Interspecific Interactions

After the initial declines, additional factors continued to prevent Olympia oyster recovery. Introduced predators (the Japanese oyster drill *Ocenebra japonica*, the flatworm *Pseudostylochus ostreaophagus,* and the copepod *Mytilicola orientalis*) have resulted in poor oyster condition, and in the case of drills, have caused high moralities (Peters, 1993). Natural predators, including starfish and diving ducks, also are thought to suppress Olympia oyster recovery. Other disturbances, including substrate disruption by ghost shrimp and mud shrimp, smothering by slipper shells, and competition with Pacific oysters for space and setting habitat are thought to affect Olympia oyster recovery negatively (Dumbauld, pers. comm.; Westley, 1976; Brown, 1976; Steele, 1957).

Stock Rebuilding Actions

Restoration of this species may include both natural and artificial enhancement strategies. Natural restoration techniques, such as water quality and habitat improvements will be the primary focus. Based on this focus, there are a number of objectives and actions necessary to rebuild Olympia oyster stocks in Washington State. Priorities, which vary with region, include:

1. Working with local experts, including the tribes and shellfish growers to define the historic and current distribution of the Olympia oyster;
2. Conducting population surveys to define current population levels to establish a benchmark for long-term monitoring and management; and
3. Defining water quality and interspecies interactions at a regional level, and identifying priority areas for restoration based at least in part on these interactions.

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References

Baker, P. 1995. Review of ecology and fishery of the Olympia oyster, *Ostrea lurida*, with annotated bibliography. J. Shellfish Res. 14:501–518.

Brown, J. 1976. Olympia oyster. Manuscript submitted to Washington Department of Fish and Wildlife, Olympia, WA.

Couch, D., and T.J. Hassler. 1989. Species profiles: life history and environmental requirements of coast fishes and invertebrates. Olympia oyster. Biological report for the U.S. Army Corps of Engineers and Department of Interior 82 (11.124) TR EL 82-4.

Dumbauld, B. 1996. Olympia oyster. Priority Habitat and Species Summary, Washington Department of Fish and Wildlife, Olympia, WA.

Dumbauld, B., and B. Kauffman. 1996. The Willapa Bay oyster reserves: A brief history and resource survey proposal. Unpublished report, Washington Department of Fish and Wildlife, Olympia, WA. 17 pp.

Elmendorf, W.W., and A.L. Kroeber. 1992. The structure of Twana Culture. Washington State University Press, Pullman, WA.

Esveldt, G.D. 1948 A review of the oyster industry of the state of Washington. Unpublished manuscript. 28 pp.

Gunter, G., and J. McKee. 1960. On oysters and sulfite waste liquor. A special report to the Washington State Pollution Control Commission. 93mpp.

McMillen, D. 1978. Letter from president, Olympia Oyster Growers Association to Washington Department of Fish and Wildlife, Olympia, WA.

Peters, R. 1993. Past and current conditions of marine resources. Big Quilcene Watershed Analysis. U.S. Forest Service, Olympic Region, Olympia, WA.

Ricketts, E., and J. Calvin. 1968. Between Pacific Tides. Stanford University Press, Stanford, CA. 614 pp.

Steele, E.N. 1957. The Olympia oyster. Fulco Publications, Elma, WA. 126 pp.

Swan, J. G. 1857. The Northwest Coast or Three Years Residence in Washington Territory. Harper Bros. Publishers, New York, NY.

Townsend, C.H. 1896. The transplanting of eastern oysters to Willapa Bay, Washington, with notes on the native oyster industry. pp 193–202. In: Report of the U.S. Fish Commissioner of Fisheries for 1895.

Washington Secretary of State, 1935. Oyster culture: A natural resource revived. Office of the Secretary of State, Olympia, WA.

Westley, R. 1976. Letter to J. Brown. Washington Department of Fish and Wildlife, Olympia, WA.

West, J.E. 1997. Protection and restoration of marine life in the inland waters of Washington State. Puget Sound/Georgia Basin Environmental Report 6. Puget Sound Water Quality Action Team, Olympia, WA.

Woelke, C. E. 1969. A history and economic evaluation of Washington State oyster reserves. Report to the Washington Department of Fisheries, Olympia, WA. 17 pp.